

Small Wind Energy Systems

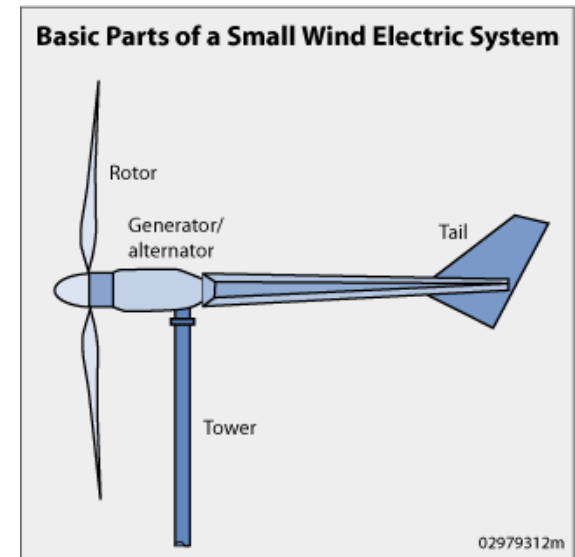
Micro ■ Hybrid ■ MET s ■ Windmills



2010 Zoning Ordinance Amendments
Planning Commission Work Session
March 16, 2010

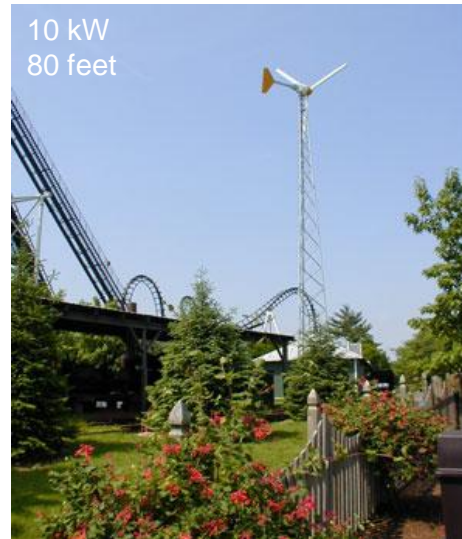
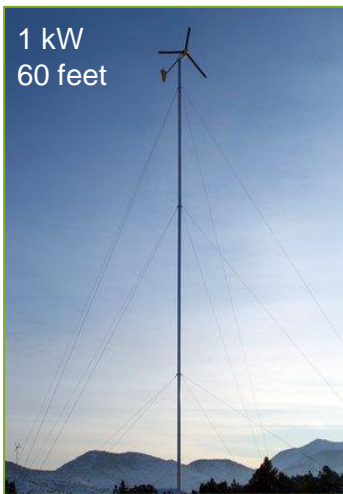
Small Wind Energy Systems

- On-site power
- Typically range from 20 W to 100 kW
(most residential systems under 10 kW)
- Horizontal or Vertical Axis
- Monopole or Guy Wired Tower
- On or Off Grid
- Turbine design life is 20 - 40 years
- Professionally engineered



How Wind Class Relates to Turbine Size

- Class 1: 1-10 kW
- Class 2: 3.7-20 kW
- Class 3 or higher: 20 kW generally required



Scale of Systems Definitions

- **Wind Energy System, Small:** A wind energy conversion system designed to supplement other electricity sources as an **accessory** use to existing buildings or facilities, wherein the power generated is used for **onsite consumption**.

A small wind energy system consists of a single wind turbine, a tower, and associated control or conversion electronics, having a rated name plate capacity of not more than **50 kilowatts** (kW) for residential uses and not more than **100 kilowatts** (kW) for other uses. For the purpose of residential net metering, Virginia Code §56-594B limits the electrical generating facility to a capacity of not more than **10 kilowatts** (kW) and **500 kilowatts** (kW) business/ commercial.



Scale of Systems Definitions

- **Wind Energy System, Micro Wind System** (*Building Integrated*): A building-mounted wind energy conversion system that has a manufacturer's rating of **10 kW or less** and projects no more than **fifteen (15) feet** above the highest point on the roof and shall not be considered a small wind energy system in terms of area and setback requirements.



Scale of Systems Definitions

- **Wind Energy System, Hybrid**: An energy conversion system that uses more than one technology to produce energy or work (i.e. a wind-solar system).



Scale of Systems

Definitions

- **Wind Monitoring Meteorological Tower:** A **temporary** tower equipped with devices to measure wind speeds and direction, used to determine how much wind power a site can be expected to generate.



Scale of Systems Definitions

- **Windmill**: A machine designed to convert the energy of the wind into more useful forms of energy using rotating blades to turn mechanical equipment to do physical work, without producing energy.
Windmills are **no greater than 60 feet** in height and are operated by the wind usually acting on oblique vanes or sails that radiate from a horizontal shaft.
Wind mills, as defined, are **not regulated as small wind energy systems**. Possible uses would be a wind-driven water pump or electric generator.



Wind Energy Rebates & Incentives

■ **Federal Tax Credit Through 2016**

- 30% of gross cost at installation
- Wind Energy System must be placed in service by December 31, 2016
- Nameplate capacity of not more than 100 kW for residential small wind turbines

■ **VA State Energy Program (SEP) Rebate Program**

- Residential & Commercial Solar and Wind Incentive Program
- VA Dept Of Mines, Minerals and Energy, Division of Energy will provide up to \$15 million in rebates
- 1st round closed November 18, 2009; 2nd round anticipated for mid-March
- 10 kW max capacity for small residential wind systems; 20 kW max for commercial systems
- Amount of rebate shall not exceed \$1,500 (1.50 per watt)

■ **Net Metering**

- Will be permitted until 1% of AEP's power sources are from renewable resources

General Use and Design Guidelines

Visual Appearance



Guyed Tower



Lattice Tower



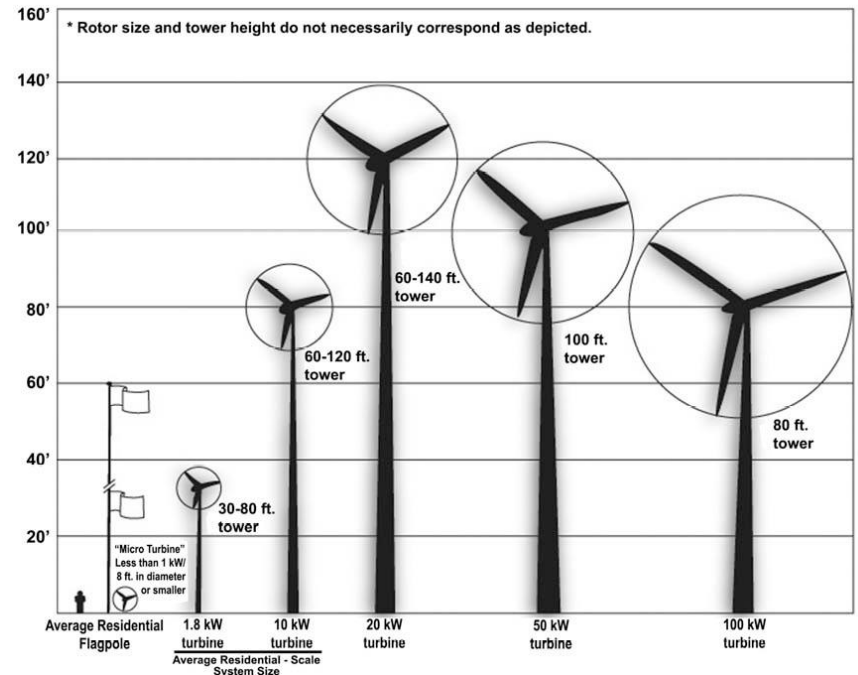
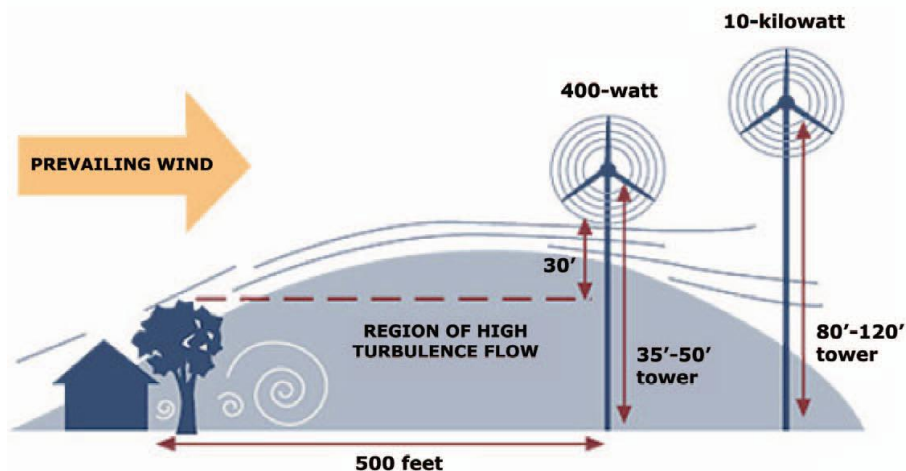
Monopole Tower

- Monopole with galvanized steel, non-reflective finish, neutral color
- Blend with surrounding landscape
- No artificial lighting unless required by FAA
- No signs, lettering, flags, streamers, trademarks, images, etc.

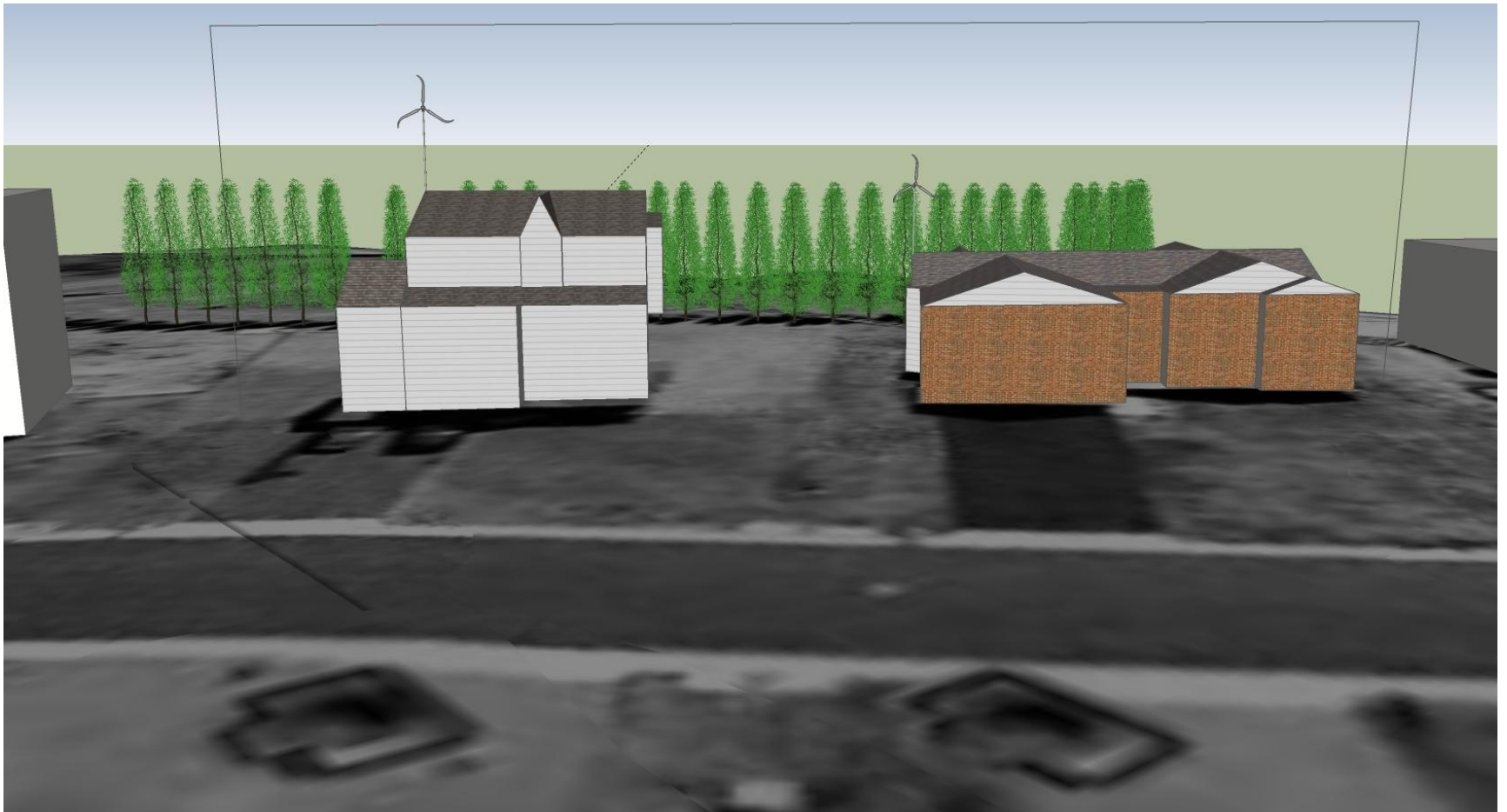
General Use and Design Standards

Height Restrictions

- Taller Turbines are more productive; above turbulence & obstructions
- Wind speeds increase with heights
- Restrictions affect economic payback
- AWEA/JMU recommends 120 feet as minimum restriction
- Shorter tower means more noise



General Use and Design Standards Building Integrated



General Use and Design Standards Setbacks

- Minimum setbacks are recommended over minimum lot sizes
- Horizontal setback 100% - 150% of height of blade + tower from all inhabited structures (adjacent property), overhead utility lines, property lines, and public roads and right-of-ways
 - Protect from structural failure, equipment failure, ice throws, etc.
- What setbacks are required for flagpoles, lamp posts and utility poles?
- Amateur Radio Towers – 40% height of tower to residential structures on adjacent parcels
- Allow easements from adjacent property owners to provide relief from setbacks?



General Use and Design Standards Wade Road



General Use and Design Standards

Wade Road – Collapsed Structure

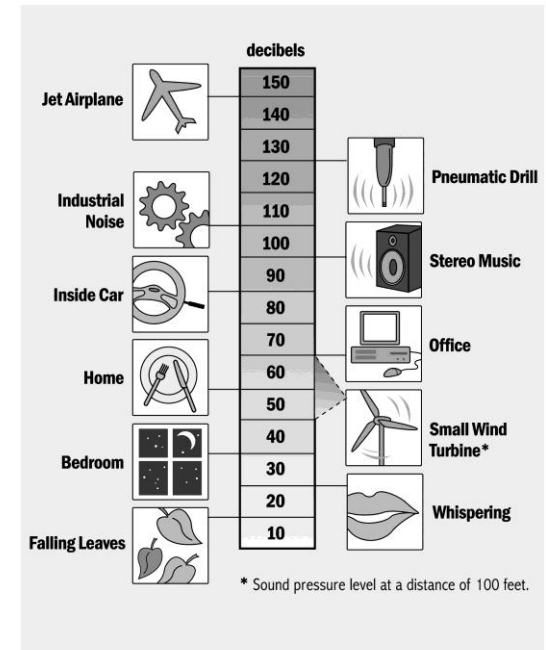
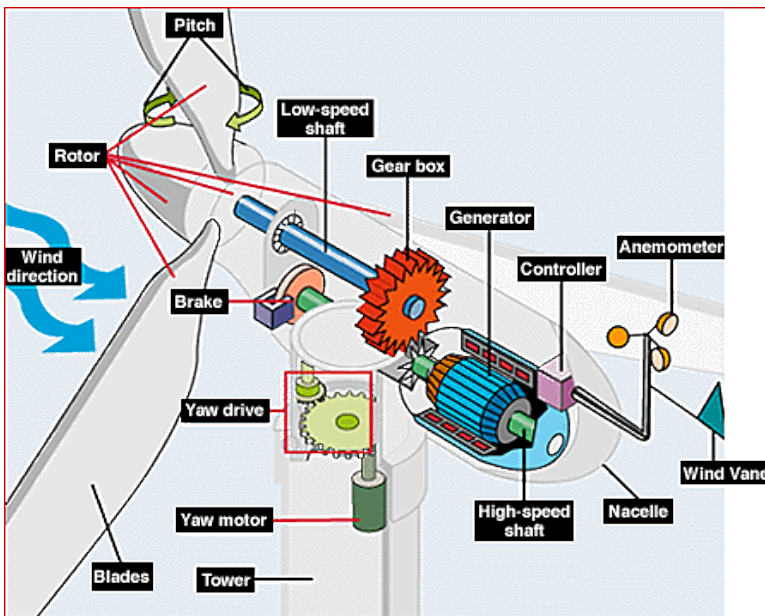


General Use and Design Standards

Sound

Standard Noise Control Measures

- Used to minimize mechanical noise
- Detailed analysis and engineering
- Aerodynamic noise remains likely dominate source
- International Electrotechnical Code (IEC)



<http://www.awea.org/faq/noisefaq.html>

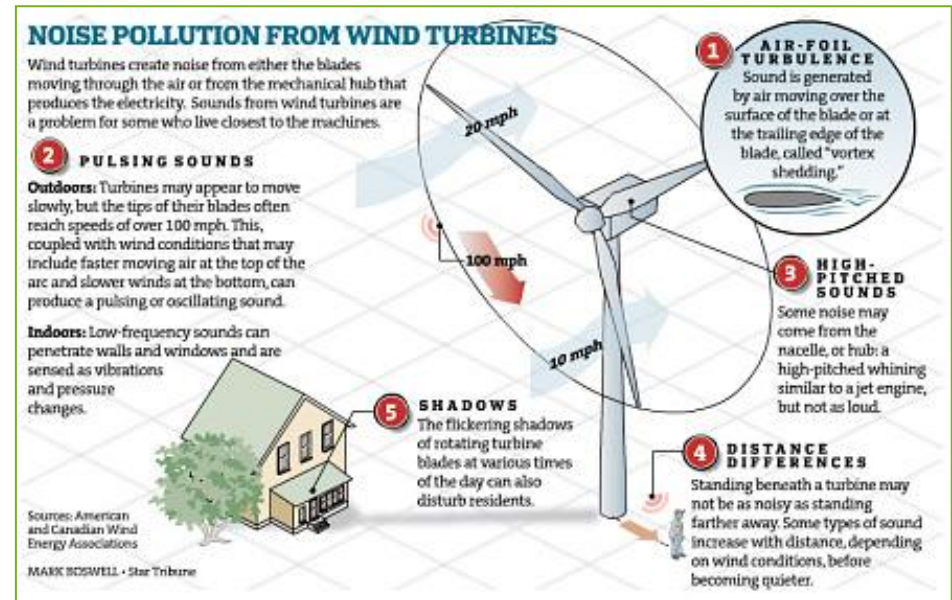
Mechanism Sources

- Gearbox
- Generator
- Yaw Drive
- Cooling Fans

General Use and Design Standards

Sound

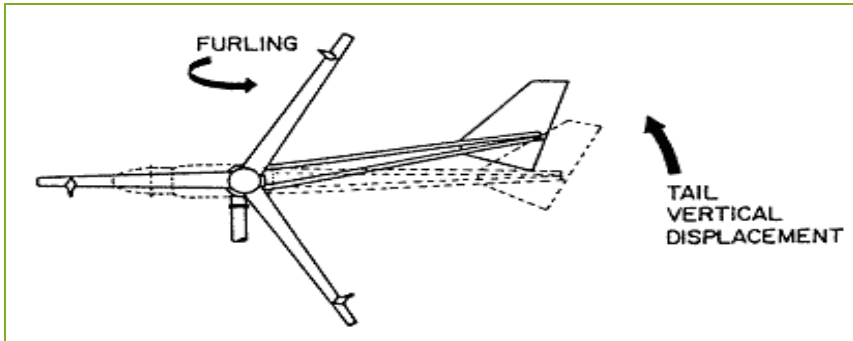
- Limit to 60 dBa as measured from nearest inhabitable structure (not property line)
- Allow exceptions for unusual conditions, such as storms
- Acoustical studies unnecessary (and expensive) for small wind
- Usually masked by ambient sounds (i.e. wind, traffic)
- Exponentially quieter with distance (i.e. at 200 feet, only $\frac{1}{4}$ the intensity as at 100 feet)



General Use and Design Standards

Ground Clearance & Safety

- Minimum distance between ground and blades: 15 to 20 feet
- Guy wires shall be visible to a height of 6 feet above ground
- Limit access to authorized personnel only; no climbing apparatus within 10 feet of ground
- Cut-Out Speeds/Side Furling
- Require safety and utility signage
- Setbacks address structural failures



Abandonment/Decommissioning

- Any wind energy system found to be unsafe by the building official shall be repaired by the owner or removed within 6 months
- Any wind turbine for which electricity is not generated for a continuous period of 12 months shall be considered abandoned; owner shall remove within 90 days of receipt of notice from County



Permitted versus Conditional Use

[illegible]

Questions, Comments, Concerns?

